

SERAFM: An Ecological Risk Assessment Tool for Evaluating Wildlife Exposure Risk Associated with Mercury-Contaminated Sediment in Lake and River Systems

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Mercury is an important environmental pollutant because of its suspected neurotoxicity and is classified as a priority pollutant by the U.S. Environmental Protection Agency (U.S. EPA) (USEPA, 1997). In 2003, the Ecological Risk Assessment Support Center (ERASC) received a request for support from Region 1. This request was referred to the ORD's Ecosystems Research Division (ERD) of the NERL in Athens, GA. This request was designed specifically to address how one can develop a remediation goal for mercury in sediment when the sediment mercury concentration may be a poor predictor of mercury exposure to biota. Additionally, this request asked the related questions of (1) "What are the best ways to estimate mercury transfer (as methylmercury) from sediment to the water column and/or the aquatic food chain, including birds and mammals feeding upon fish and aquatic invertebrates?" and (2) "Should remediation goals for mercury in sediment be developed for methylmercury only or perhaps total mercury normalized for factors associated with methylation?" These questions were addressed through the development of a tool to assist a regulator in deriving a remediation goal for mercury-contaminated lake and river ecosystems. A spreadsheet model, Spreadsheet-based Ecological Risk Assessment for the Fate of Mercury (SERAFM), was developed that can be used as a risk assessment tool for mercury-contaminated ecosystems. In this tool, process-based understanding of the chemical, physical, and biological processes governing mercury fate and transport is incorporated into a modeling framework to assist with a wildlife risk assessment for an aquatic ecosystem with mercury contaminated sediments. The model calculates exposure mercury concentrations in the sediment, water column, and food web, plus hazard indices for exposed wildlife and humans for three scenarios: historical case of mercury-contaminated sediments, required clean-up levels to protect the most sensitive species, and background conditions (as if there were no direct sediment contamination).

Although this work was reviewed by the U.S. Environmental Protection Agency and approved for publication, it may not necessarily reflect official Agency policy.